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# Swedish perspective on wood fuel pellets for household heating: A modified standard for pellets could reduce end-user problems

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ABSTRACT

The use of wood fuel pellets has increased significantly over the past few years, and since 2006 the households use the major part of the pellets available in Sweden. During the same period, the oil heating has decreased. Many former oil users that were used to almost maintenance-free heating systems now use pellets. Despite significant improvements of pellet quality and storage and burner equipment, there are still some problems that the household pellets user encounters. In this work, common end-user problems are identified. The cause of each problem, as well as whether a modified Swedish standard for pellets could reduce some of the problems encountered, is analysed. The results show that the most serious problems originate from the crumbling of pellets. We conclude that many of the problems could be avoided by modifying the Swedish standard, e.g., the quality parameters could be set using intervals instead of threshold values.



## 1. Introduction

In Sweden, the price of oil and electricity has increased during recent years. Taxes on carbon dioxide emissions from fossil fuels are economically in favour of renewable energy sources such as wood fuel pellets. As a consequence, several households, i.e., single-family house owners, have converted their heating systems, e.g., to wood fuel pellets heating. In Sweden, typical wood fuel pellet heating systems consist of: fuel storage; feeding screw (from the storage to the burner); burner; and boiler. The heating systems are mostly half automatic and often two component devices (a pellet burner is often combined with an oil boiler). The price gap between the fossil fuels and pellets decreased in 2006. Nevertheless, it is still economically favourable to convert the heating system.

The use of wood fuel pellets for household heating increased significantly between 2004 and 2006, by some 33% [1]. The small-scale users (households <25 kW) and intermediate-scale users (apartment building 25 kW–2 MW) form the major category of customers since 2004 (see Fig. 1).

Different kinds of users have different kinds of priorities. For pioneer users of new technology, design, service and function are not all that important according to Karlsson [2]. The pioneer users of wood fuel pellets as a source of heat in households were the enthusiasts of environmentally friendly heating systems. They put in some work of their own to make the system function, and they have a high tolerance towards operational disturbances. Recently, people that want to reduce their cost of energy, i.e., improve their heating economy by converting their heating systems, and users that

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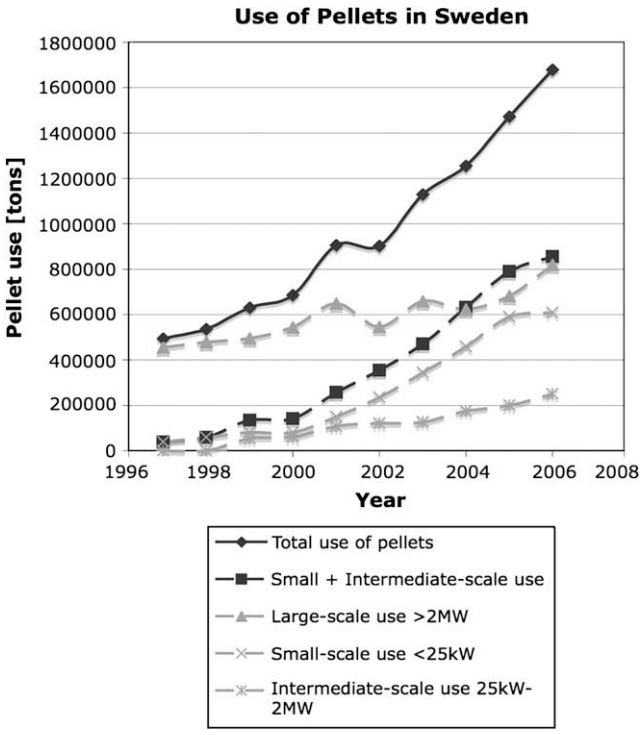


**Fig. 1 – The use of wood fuel pellets in Sweden (adapted from PiR, 2006 [35]).**

demand maintenance free heating devices, have started to use pellets. In addition, since pellets heating competes with district heating and heat pumps as a source of heat for households, it is crucial that the problems connected with the use of pellets be reduced to a minimum. This implies that the wood fuel pellets delivered to the household user should be of sufficient quality to avoid problems during usage. The fact that the households—i.e., a more product quality demanding customer—now dominate the wood fuel pellet market makes their demands for high-grade fuel even more important for the pellet industry than they were before. The households are more quality demanding, e.g., as they have a relatively simple conversion installation that most often do not have advanced controls or professional management (trained personnel supervision, fully automatic equipment) [3], i.e., the household user cannot be as tolerant of differences in the pellet quality as the large-scale user could.

Problems, such as operational disturbances and inconvenient management issues, could partly be avoided by the use of a standard, which would also increase the quality of the product. A high-quality product will increase customer confidence, and a standard will work as a facilitator for transactions between buyers and sellers [2,4]. Therefore, quality assurance provided through standardisation is crucial. In Sweden, the producers of wood fuel pellets for the household market strive to fulfil the criteria of the Swedish standard for pellets SS 187120 [5]. Selling pellets in accordance with the Swedish standard guarantees an official national quality of fuel pellets. This standard provides guidelines to the producer and can be used to inform the final consumer about quality characteristics [6]. The Swedish standard was one of the first standardisations for wood fuel pellets in Europe, and it is still a legally valid regulation. Since 1998, it has defined quality parameters for wood fuel pellets. The characteristics specified are: dimension; bulk density; durability; heating value; contents of ash, moisture, sulphur, chlorine and additives; and the ash melting point. All parameters emanate from pellets as a product leaving the producer. In the standard, there is one example of a high-quality class of solid biofuels recommended for household usage, i.e., pellets classified in Group 1.

According to a test performed by Löfgren and Arkelöv [9], all Swedish manufacturers of pellets seem to fulfil the criteria of the Swedish standard for pellets. However, a new delivery to the end-user (or change of distributor) of pellets can cause or solve the problems encountered implying significant variations in the quality of delivered pellets [9,32]. This indicates that modifications to the standard are necessary.

Quality is defined as ''the degree to which a set of inherent characteristics fulfils requirements'' [7]. The aim of this work is to identify and evaluate the quality problems that can be reduced should modifications to the Swedish standard for pellets SS 187120 be made. This implies that an analysis has to be made of how the standardised parameters have worked up until today concerning household usage of wood fuel pellets in accordance with the quality statement above.

## 2. Method

A literature study was made based on scientific journals, reports from different projects (industrial, academic or independent) and various blog sites. The blog sites were used as a source of information concerning reported problems since there are few scientifically documented cases of problems encountered by household users. The literature study was made in order to identify and describe reported problems that the single-house owner experiences using wood fuel pellets as a source of heat. The identified problems are described and classified according to the following groups: shutdown problems (unintentional equipment shutdown issues), convenient management problems (troublesome equipment and product operation issues) and heat economy problems (decreasing efficiency issues). The most commonly reported problems in the found literature were then chosen for further analysis.

The first analysis attends to the origins of the problems, i.e., what causes the problems. This analysis was based on the studied literature and the personal communication we had with people within the wood fuel pellets business in order to make a survey of the cause (or causes) of each specific problem (combinations of causes are possible). The causes of each identified problem are presented below.

The second analysis aims at identifying the problems/causes that could be reduced if changes to the Swedish standard for pellets SS 187120 were to be made. The identified and classified encountered problems are evaluated regarding the regulated parameters in the standard. Based on the literature and personal communications, an attempt to link a specific problem/cause to the existing parameter regulation in the standard is made and modifications are discussed. Not all parameters in the Swedish standard for pellets are